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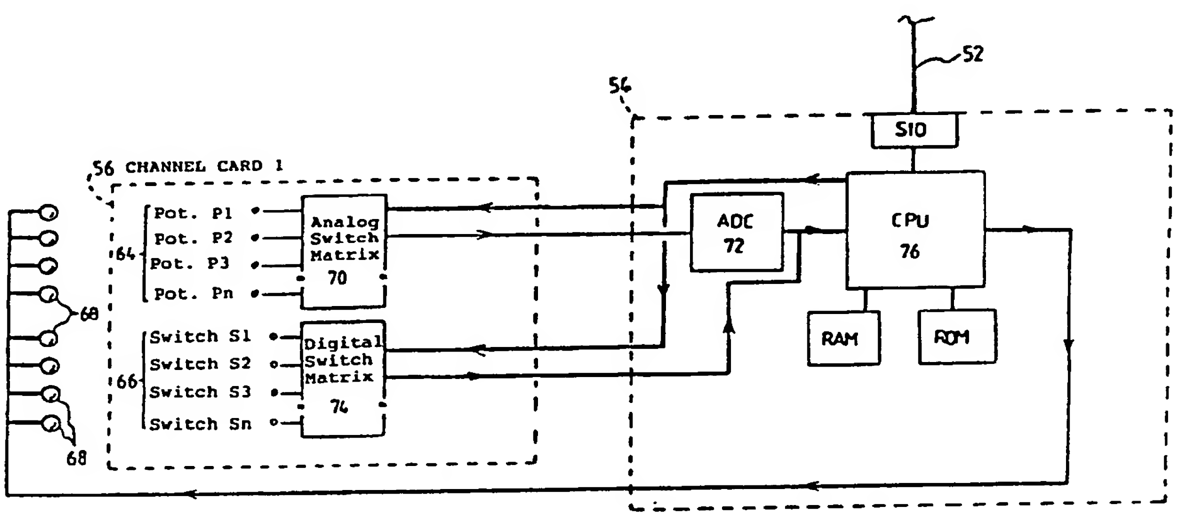
(54) Title: RESET SYSTEM FOR MEMORIZING AND RECALLING A DESIRED STATE OF A CONTROL ELEMENT



(57) Abstract

A reset system for memorising and then recalling a desired state of a control element (64, 66) such as a knob, a lever or a switch. In a preferred embodiment, suitable for application to mixing consoles, a master processor (50) and a plurality of slave processors (54) co-operate with the channels of the console to sense the states of each control element (64, 66) on the console. Where the actual state of a control element (64, 66) differs from the recorded desired state, a difference signal is generated. The difference signal indicates to a user via indicating means (68) that the control element (64, 66) must be adjusted in order to reset it to the desired state. The indicating means (68) preferably includes a single indicator such as a single LED (68) associated with each control element (64, 66). The indicating means (68) is preferably capable of indicating the degree to which the actual and desired states differ.

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Reset system for memorizing and recalling a desired state of a control element.

This invention relates to a reset system for memorising and then recalling a desired state of a control element such as a knob, a lever or a switch, so that the control element, if adjusted away from the desired state, can be reset to the desired state.

Almost every device, whether electrical, electronic or mechanical, includes one or more control elements such as knobs, levers or switches. Some devices have more control elements than others. For example, a basic audio amplifier may have only two or three knobs or switches. Other devices, notably audio mixing consoles for use in recording studios or at concert venues, have a multitude of control elements. By way of illustration, a typical professional mixing console has thirty-two channels, and each channel may have twenty or more rotary potentiometers each controlled by a separate knob, one sliding potentiometer such as a fader and, say, sixteen push-button switches.

In many cases, it is desirable or indeed essential to memorise the state of each control element of a device, so that the control elements can be returned to their respective memorised states when required. For example, a person listening to music through an audio amplifier may wish occasionally to reset its volume or tone controls to levels which best suit the particular piece of music being listened to. Furthermore, referring back to the example of a mixing console, different pieces of music or different musicians will usually warrant different console settings. Consequently, bearing in mind that a mixing console will usually be used for a variety of different pieces of music, and for different musicians, it is prudent to remember the settings appropriate to each piece or musician as the case may be, for possible future use.

Where the control elements are few in number, it is generally feasible, if occasionally fallible, to make a mental note of the desired settings or states. However, this task becomes very much more difficult as the number of control elements increases, especially if some of the control elements have a steplessly variable action. Thus, users of mixing consoles or similarly complex devices often have to rely upon aids such as sketches, tables, or photographs to remind them of the preferred control element settings. It will be appreciated that preparing and using these aids can be inconvenient, time consuming and therefore costly. Moreover, there is no guarantee that resetting will be accurate, particularly if some of the control elements are knobs whose working range of angular movement exceeds 360 degrees.

In view of the drawbacks outlined above, reset systems have been proposed which can automatically memorise the desired states of control elements and can then assist a user in resetting each control element to its desired state. One such reset system is disclosed in U.S. Patent No. 4479240 granted in 1984 to Robert H. McKinley, Jr..

In the McKinley system, recording means are provided for recording the position of control elements on modules of a mixing console, for subsequent recall. Indicating means are also provided for indicating to a user, upon recall of the recorded position, that a control element is not at the recorded position. Separate indicating means are associated with each control element, thus indicating which control elements have to be adjusted to obtain the previously recorded set-up. These control elements can then be manually adjusted back to their respective recorded positions.

Each indicating means of the McKinley system comprises a pair of LED indicators situated adjacent to each control element on a panel bearing a multitude of control elements. The arrangement is such that when the control element is at the

previously recorded (i.e. desired) state, both LEDs are off. If the control element is not at the desired state, one or other of the LEDs is illuminated. One LED, when illuminated, indicates that the control element is above (i.e. on one side of) the desired state, and the other LED, when illuminated, indicates that the control element is below (i.e. on the other side of) the desired state. Thus, the direction of movement of the control element required to achieve the desired state is also indicated to the user.

Whilst the McKinley system is an improvement over previous means for resetting the state of control elements, it is also needlessly complex. The provision of two LEDs for each control element, plus the circuitry required to drive and control the LEDs, adds to the complexity and cost of the mixing console and detracts from its reliability. In addition, the multiple LEDs reduce the space available on the panel bearing the control elements and also behind that panel, i.e. within the device of which the control elements are a part. As a result, the device may be bulkier and heavier than is necessary or desirable. Also, the components within the device may be in closer proximity to one another than is desirable, making maintenance difficult and limiting freedom of design.

It is against this background that the present invention was made. Applicant has found, surprisingly, that just one LED or other indicator associated with each control element is sufficient to indicate to a user not only which control elements are in need of adjustment, but also which way to adjust the control elements in order to achieve the respective desired states. It is also possible, using just one LED or other indicator per control element, to indicate how far away from the desired state each control element is.

From one aspect, the invention may be expressed as a reset system comprising sensor means arranged to sense the state of a control element, recording means arranged to record a

desired state of the control element, comparator means arranged to compare the recorded desired state with the actual state of the control element, and indicating means arranged to indicate the relationship between the desired and actual states of that control element, characterised in that the indicating means consists of a single indicator associated with the control element.

It is preferred that the indicator is an LED although it is possible that other, preferably visual indicators such as LCD columns, vacuum fluorescent displays or even light bulbs could be used instead.

Advantageously, the indicator is associated with the control element by virtue of proximity. That is to say, the indicator is preferably adjacent to or in the vicinity of the control element. However, association between the control element and the indicator may be achieved in other ways. For example, the indicator may be incorporated into the control element.

Preferably, the indicator is dedicated to its associated control element, so that there is one indicator for each control element.

In the simplest arrangement of this invention, the indicator indicates only that the actual and desired states differ from one another. Thus, if the indicator is an LED, the LED illuminates only when there is a difference between the respective states. It follows that when the LED is not illuminated, the control element is at the desired state. So, to reset the control element to the desired state, all that need be done is to adjust the control element until the LED goes out. This arrangement is particularly suitable for resetting two-state control elements such as push-button switches. These need only be toggled to their other state if their actual state differs from the desired state.

In an alternative, but not currently preferred, arrangement the LED comes on only at the desired state i.e. when the actual and desired states equate.

In more sophisticated embodiments, the indicator can give an indication of the degree to which the actual and desired states differ from one another. If the indicator is an LED, this indication is suitably given by its intensity or brightness although other indications, such as variable-rate flashing, may be employed instead. This arrangement is particularly suitable for resetting potentiometers or other control elements that have more than two possible states. When the control element is adjusted in one or other direction, the indicator indicates whether the difference between the actual and desired states is increasing or decreasing. If the difference is increasing, the control element should be adjusted in the other direction in order to achieve the desired state. If the difference is decreasing, continued adjustment in the same direction will reset the control element to the desired state. Either way, it is quickly evident to the user which way the control element should be adjusted in order to achieve the desired state.

Variations in brightness or intensity of the LED or other indicator may be effected by pulse width modulation, which is preferred, or by variations in current passing through the LED. In pulse width modulation, the LED is cycled on and off at high frequency, and the average brightness or intensity of the LED is determined by the variable proportion of 'on' time to 'off' time.

It is preferred that the brightness or intensity of the indicator is proportional to the difference between the desired and actual states. Inverse proportionality is also possible, but is not currently preferred.

The concept of varying an indicator characteristic (preferably

brightness or intensity) to indicate the degree of difference between the actual and desired states is not limited to single-indicator arrangements. It can also be applied to multi-indicator arrangements. Thus, from another aspect, the invention may be expressed as a reset system comprising sensor means arranged to sense the state of a control element, recording means arranged to record a desired state of the control element, comparator means arranged to compare the recorded desired state with the actual state of the control element, and indicating means arranged to indicate the relationship between the desired state and the actual state, characterised in that the indicating means is capable of indicating the degree to which the desired and actual states differ from one another.

The invention also includes apparatus, such as a mixing console, incorporating or fitted with a reset system as defined in accordance with any aspect of this invention.

Another aspect of the invention provides a method of resetting a control element to a recorded desired state, comprising sensing the actual state of the control element, recalling the recorded desired state, comparing the actual state with the desired state to express the magnitude of any difference between the actual and desired states as a difference signal, and producing an indication to a user, which indication is representative of the difference signal and thus of the degree of difference between the actual and desired states.

In a still further aspect, the invention provides a reset system for a mixing console having a plurality of channels, which system includes a plurality of slave computers or processors each associated with a respective channel of the mixing console, and all being under the control of a master computer or processor. Or, in more general terms, the invention provides a system for resetting a plurality of control elements to their respective desired states, the

system including a plurality of slave computers or processors under the control of a master computer or processor, with each slave computer or processor co-operating with a respective sub-group of said plurality of control elements to compare the actual state of each control element with the desired state for that control element.

In order that this invention may be more readily understood, reference will now be made, by way of example only, to the accompanying drawings, in which:

Figure 1 is a schematic circuit diagram illustrating the master-slave concept of this invention applied to a mixing console;

Figure 2 is a schematic plan view showing the control elements associated with one channel of a mixing console arranged in accordance with the invention; and

Figure 3 is a schematic circuit diagram illustrating the operation of a slave computer constructed in accordance with an aspect of this invention.

In Figure 1, a master processor or computer 50 is linked by a common bus 52 to a plurality of slave processors or computers 54, so that the master computer 50 acts as a hierarchical controller for the slave computers 54. One slave computer 54 is associated with or incorporated into each channel card 56,58,60 of a mixing console. Only three channel cards are shown for clarity although, in reality, the mixing console will usually have many more than three channels.

The master computer 50 and the slave computers 54 are suitably identical to one another in terms of hardware, so as to minimise manufacturing costs. Suitable devices include single-chip microcontrollers marketed by Panasonic (model numbers MN18801A or MN188166), Motorola (MC68HC11), or Mullard

(PCB83C552). These devices have a built-in ROM, RAM, parallel I/O, LED drivers, serial I/O for communications between master and slave, and an on-chip analog to digital converter (ADC).

The master computer 50 serves to format, save and retrieve data concerning the control element states. This data can be stored on a readily-portable external medium such as a disk or, preferably, a more robust memory card carrying a memory chip.

In a 'memorise' operation, the console operator issues an appropriate command to the master computer 50. The master computer 50 then, in turn, commands each slave computer 54 to ascertain the state of each control element of its respective channel. The states of the various control elements are sensed and then the slave computer 54 reports back to the master computer 50 by passing data defining the state of each control element along the bus 52, so that the data can be formatted and stored for later use. It will be clear that the memorise operation can be completed at high speed because the slave computers 54, once activated, perform their sensing functions in parallel.

When it is desired to recall the memorised control element states, the console operator issues a 'recall' command to the master computer 50 after having transferred the stored data into its memory from the appropriate memory card or other medium. Then, the master computer 50 transfers the data to the slave computers 54, each slave computer 54 receiving the data that it generated during the memorise operation. In this way each slave computer 54 is told the desired state of each control element with which it is associated.

The main function of a slave computer 54 during a recall operation is to co-operate with the control elements of the channel card with which it is associated in order to ascertain the actual state of each control element. Then, the slave

computer 54 compares the actual state with the desired state for each control element and produces a signal if there is a detectable difference between the states. This signal may be called a 'difference signal'.

In preferred arrangements of the invention, the difference signal is used simply to indicate to the console operator that the actual state of a particular control element differs from its desired state. Then, the operator can adjust that control element manually until the difference between the desired and actual states is eliminated, at which point the difference signal will cease. However, it will also be clear that, if desired, the difference signal could be used by control circuitry arranged to drive servo motors or the like to adjust the control elements automatically to their desired states. Such an arrangement would, however, be mechanically complex in a device having many control elements, whereas the preferred arrangements do not require the addition of further moving parts.

Figures 2 and 3 illustrate a preferred arrangement in more detail. In Figure 2, one channel of a typical mixing console has a control panel 62 bearing thirty-six control elements, namely twenty rotary potentiometers 64 and sixteen push-button switches 66. The control panel 62 also bears thirty-six light-emitting diodes (LED's) 68, one situated in close proximity to each control element 64, 66 so that each control element 64,66 has one associated LED 68.

As shown in Figure 2, each control element 64,66 is connected to the slave computer 54 associated with that particular channel, so that the slave computer 54 can ascertain the actual state of each control element 64,66.

The method by which the actual state is ascertained depends upon whether the control element is a switch 66 or a potentiometer 64. The potentiometers 64 are switched in one

by one using an analog switch matrix 70 and the voltage level indicating the state of each potentiometer is then converted into digital form by an ADC 72. The switches are also switched in one-by-one using a digital switch matrix 74. Thus, the actual state of each control element 64,66 is expressed in binary form and is then compared with the desired state of that control element (held in RAM) by the central processing unit (CPU) 76 of the slave computer 54. Where a difference exists between the actual and desired states, the CPU 76 generates a difference signal which illuminates the LED 68 associated with the control element 64,66 concerned. In this way, the operator is told which control element 64,66 have been adjusted since the control element states were memorised. Then, all that the operator need do is to adjust these control elements 64,66 by, for example, turning potentiometer knobs or toggling switches, until the associated LED's 68 go out. When an LED 68 goes out, there is no difference signal and therefore the actual state of the associated control element 64,66 equates with the desired state. At this point, the resetting operation for that control element 64,66 is complete.

As will be clear, the 'recall' operation is quick and convenient. Processing speed is enhanced because the slave computers 54 perform their operations in parallel and do not need to report back to the master computer.

Where the control element is a potentiometer 64, it is preferred that the difference signal is related to, and preferably proportional to, the difference between the actual and desired states. This helps to guide the operator in finding the desired state, because the LED 68 will increase in brightness as the difference increases, but will progressively dim as the desired state is approached until, at the desired state, it goes out entirely. Should the desired state be passed, the LED 68 will illuminate again.

This variable-brightness effect may be achieved in at least two ways. One way is to express the difference between the actual and desired states i.e. the magnitude of the difference signal in binary form, and then to convert the binary number into a corresponding voltage level with a low-impedance digital-to-analog converter (DAC). By applying this variable voltage across the LED (usually in series with a dropping resistor), the current passing through the LED, and thus its brightness, can be varied. However, this arrangement requires a separate DAC for each indicator and may, therefore, prove to be prohibitively expensive. Thus, an alternative arrangement employing pulse-width modulation (PWM) is currently preferred, because a PWM signal can easily be derived from a digital computer without the need for conversion between the digital and analog domains.

In the PWM arrangement, during a recall operation, software programmed into the slave computers 54 performs the following functions:

1. A loop counter N counts cyclically from 1 to 24 (24 being the maximum number of potentiometers that each slave computer can handle in this embodiment, although in other embodiments a slave computer may be able to handle more).

Within the loop, the following steps take place:

(a) an external analog multiplexer switches the Nth potentiometer to the internal ADC;

(b) an analog to digital conversion is performed on the Nth potentiometer to produce a value V_c;

(c) an accumulated or averaged value (V_c') of previous analog to digital conversions on the Nth potentiometer (i.e. conversions on that potentiometer in previous cycles) is taken and applied to a digital filter together with the value V_c

derived from the present cycle. The filter characteristics are 7/8ths V_c' plus 1/8th V_c. This helps to eliminate the 'dithering' effects that are inherent in analog to digital conversion;

(d) the digitally-filtered result, which is taken to be the actual state or position value of potentiometer N, is compared to the recorded desired state value in one of two ways, viz.

(i) If the actual state value is greater than or equal to the desired state value, the desired state value is subtracted from the actual state value to produce a 'difference signal'.

(ii) If the actual state value is less than the desired state value, the actual state value is subtracted from the desired state value to produce a 'difference signal'.

(e) the 'difference signal' is expressed as one of 256 eight-bit binary numbers, and is then divided by 10 and maximised to 23. This gives a value in the range 0 to 23 (i.e. 24 possible states, chosen to coincide with the maximum number of potentiometers associated with the slave computer). This difference value is then placed into a PWM register for potentiometer N.

(f) All 24 PWM registers are sequentially and cyclically tested and, depending on the value a register contains, one of the following occurs:

(i) If the PWM register value is zero, the LED output driver associated with that PWM register is set to logic 0 or zero volts.

(ii) If the PWM register value is greater than zero, its value is reduced by one and the LED output driver associated with that PWM register is set to logic 1 or five volts. Thus, with further iterations through the loop in each cycle the PWM

register value will eventually decrement to zero, whereupon the LED output driver associated with that PWM register will be set to logic 0. Thus, PWM registers containing a relatively high value will take longer to reach zero than those containing a relatively low value, and such relatively high-value registers will therefore remain at logic 1 for longer in each cycle than will relatively low-value registers. So, in any given cycle, LEDs associated with high-value registers will remain on for longer than LEDs associated with low-value registers, the balance in 'on' time to 'off' time determining the average brightness of the LED over a series of cycles.

(g) End of loop.

The variable-current system outlined previously may employ a similar software arrangement, but omitting step (f). Thus, the value presented to the DAC will be the difference signal as calculated at step (e) or (d). Ideally, however, the difference signal should be calculated to maximise the resolution of the DAC. Thus, for a six-bit DAC, the maximum value of the difference signal should be 2^6 minus 1, that is, 63.

It is preferred that each potentiometer 64 is of two-part type, with one part being dedicated to control of an audio circuit and the other part being dedicated to sensing of the potentiometer's state. Thus, the potentiometer's primary function i.e. that of controlling an audio circuit is kept separate from the secondary function of sensing its own state. This minimises disruption of the audio path within the mixing console.

It will be clear to those skilled in the art that this invention is not limited only to the embodiments described herein, but includes all modifications and variations falling within its scope.

CLAIMS

1. A reset system comprising sensor means arranged to sense the state of a control element, recording means arranged to record a desired state of the control element, comparator means arranged to compare the recorded desired state with the actual state of the control element, and indicating means arranged to indicate the relationship between the desired and actual states of that control element, characterised in that the indicating means consists of a single indicator associated with the control element.

2. A reset system according to claim 1, wherein the indicator is a visual indicator.

3. A reset system according to claim 1 or claim 2, wherein the indicator is an LED.

4. A reset system according to any preceding claim, wherein the indicator is associated with the control element by virtue of its proximity to the control element.

5. A reset system according to any preceding claim, wherein the indicator is dedicated to the control element.

6. A reset system according to any preceding claim, and arranged such that the indicator is capable of indicating that there is a difference between the actual state and the desired state.

7. A reset system according to any preceding claim, and arranged such that the indicator is capable of indicating the degree of difference between the actual state and the desired state.

8. A reset system according to claim 7, wherein the degree of difference is indicated by a variable characteristic of the

indicator.

9. A reset system according to claim 8, wherein the indicator is a visual indicator and the variable characteristic is the brightness or luminous intensity of the indicator.

10. A reset system according to claim 9, wherein a pulse width modulated signal is applied to the indicator.

11. A reset system according to claim 9, wherein a variable voltage signal is applied to the indicator.

12. A reset system according to any of claims 9 to 11, wherein the brightness or luminous intensity of the indicator is proportional to the difference between the desired and actual states.

13. A reset system according to claim 1, but instead characterised in that the indicating means is capable of indicating the degree to which the desired and actual states differ from one another.

14. A reset system according to claim 13, wherein the difference is indicated by a variable characteristic of the indicating means.

15. A reset system according to claim 14, wherein the indicating means is visual and the variable characteristic is brightness or luminous intensity.

16. A reset system according to any of claims 13 to 15, wherein the indicating means consists of a single indicator associated with the control element.

17. Apparatus incorporating or fitted with a reset system according to any preceding claim.

18. A method of resetting a control element to a recorded desired state, comprising sensing the actual state of the control element, recalling the recorded desired state, comparing the actual state with the desired state to express the magnitude of any difference between the actual and desired states as a difference signal, and producing an indication to a user, which indication is representative of the difference signal and thus of the degree of difference between the actual and desired states.

19. A method according to claim 18, wherein the indication has a variable characteristic that is representative of the difference signal.

20. A method according to claim 19, wherein the indication is a visual indication and the variable characteristic is brightness or luminous intensity.

21. A method according to any of claims 18 to 20, wherein the difference signal is expressed as a variable voltage signal.

22. A method according to any of claims 18 to 20, wherein the difference signal is expressed as a pulse width modulated signal.

23. A method according to claim 22 and suitable for resetting a plurality of control elements, wherein: the difference signal for each control element, expressed as a difference value, is placed in a PWM register associated with that control element; the PWM registers of the plurality of control elements are sequentially and iteratively tested; the difference value in a PWM register, if more than zero, is decremented on each test loop; a first logic level is output if the difference value in a PWM register is greater than zero; and a second logic level is output if the difference value in a PWM register is zero.

24. A method according to claim 23, wherein the first logic level is logic 1 or five volts, and the second logic level is logic 0 or zero volts.

25. A method according to any of claims 18 to 24, wherein sensing of the actual state of a control element includes the following: the control element is switched repeatedly to an ADC; the actual state of the control element, expressed in analog form, is converted to digital form by the ADC; the result V_c of that analog to digital conversion is applied to a digital filter together with the result V_c' of at least one previous analog to digital conversion on that control element; and the digitally-filtered result is taken to represent the actual state of the control element.

26. A method according to claim 25, wherein the proportion of V_c' in the digitally-filtered result is equal to or greater than the proportion of V_c.

27. A method according to claim 26, wherein the digitally-filtered result comprises V_c' and V_c in the ratio 7:1.

28. A method of resetting a control element to a recorded desired state, comprising: sensing or determining the actual state of the control element; recalling the recorded desired state; comparing the actual state with the desired state; and, if the actual state and the desired state differ from one another, actuating a single indicator only.

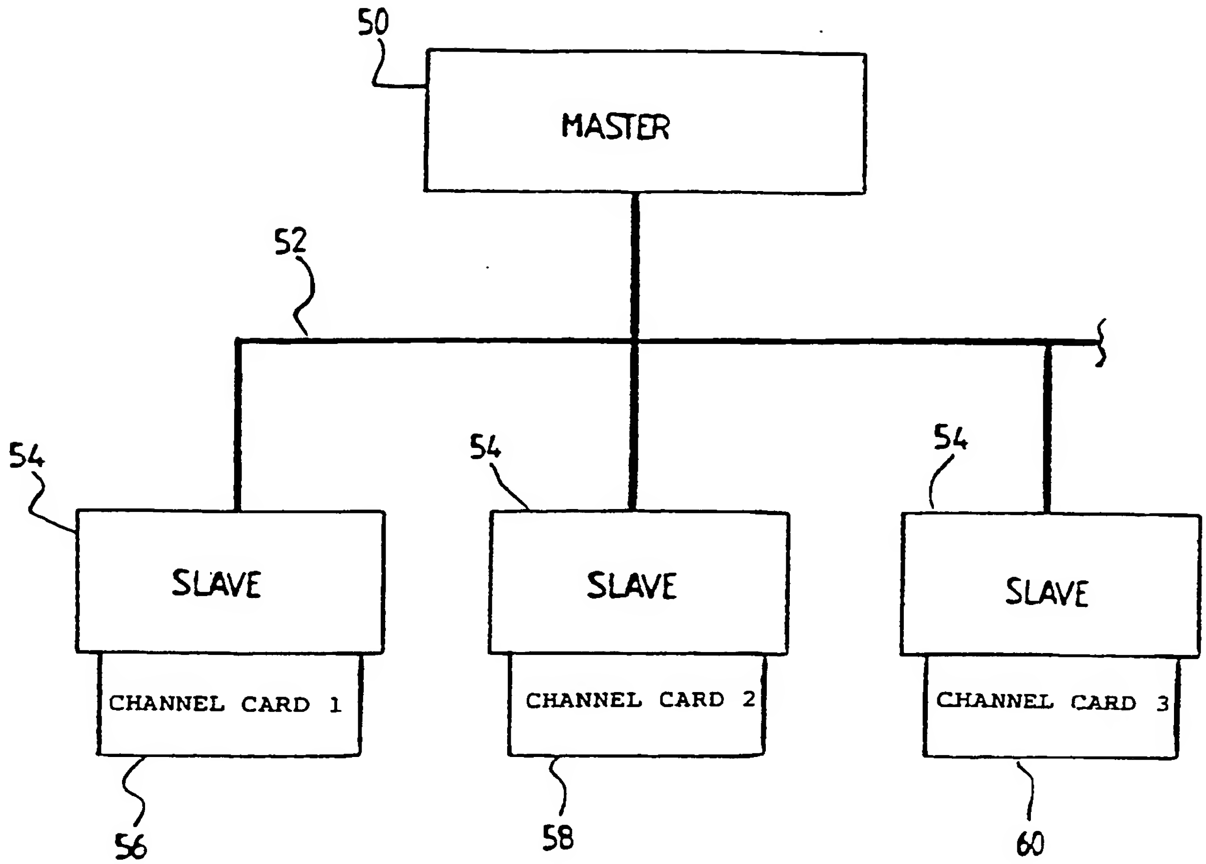
50
MASTER
52
54
SLAVE
54
SLAVE
54
SLAVE
CHANNEL CARD 1
CHANNEL CARD 2
CHANNEL CARD 3
56
58
60

FIG. 1

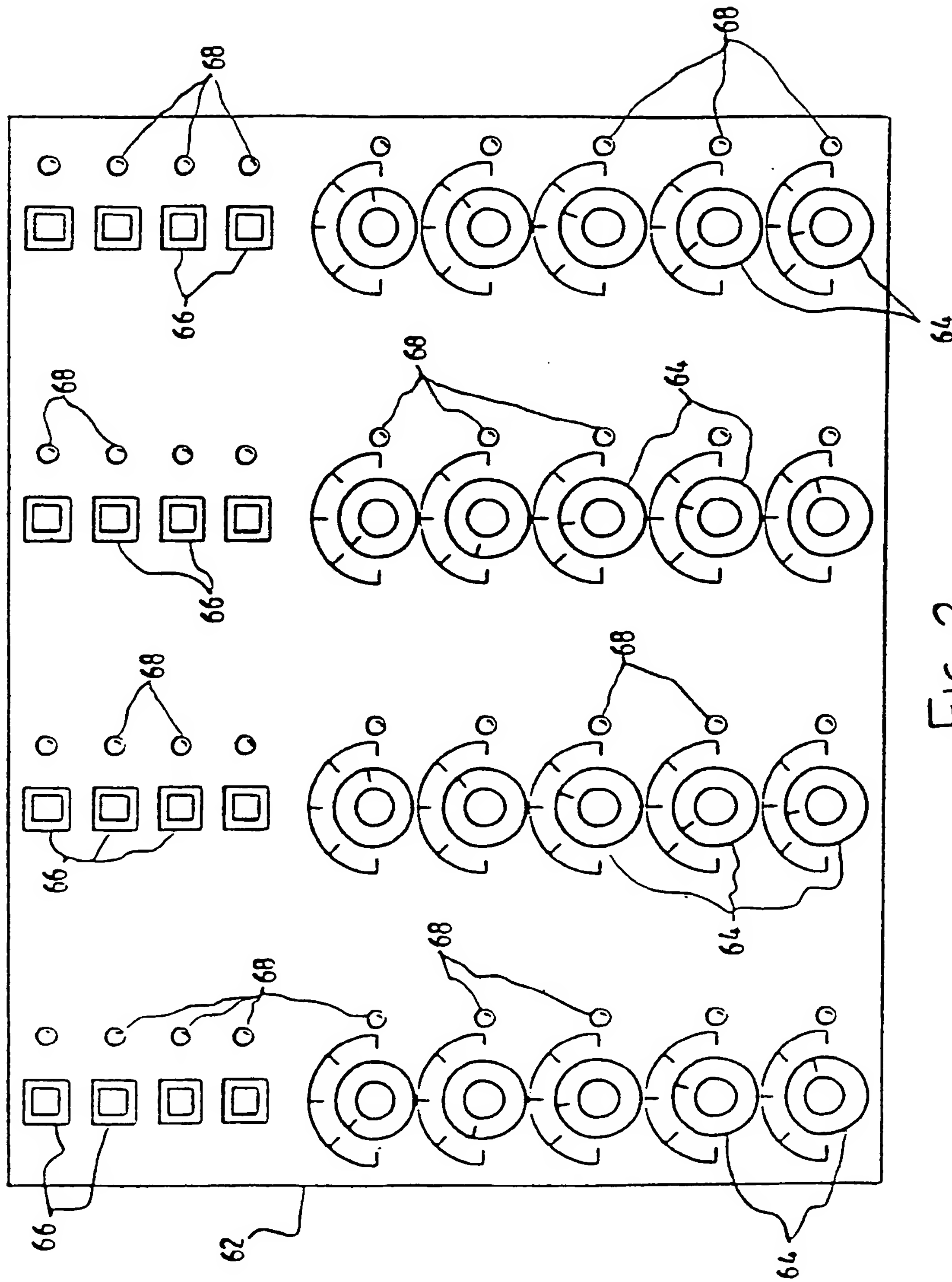

FIG. 2

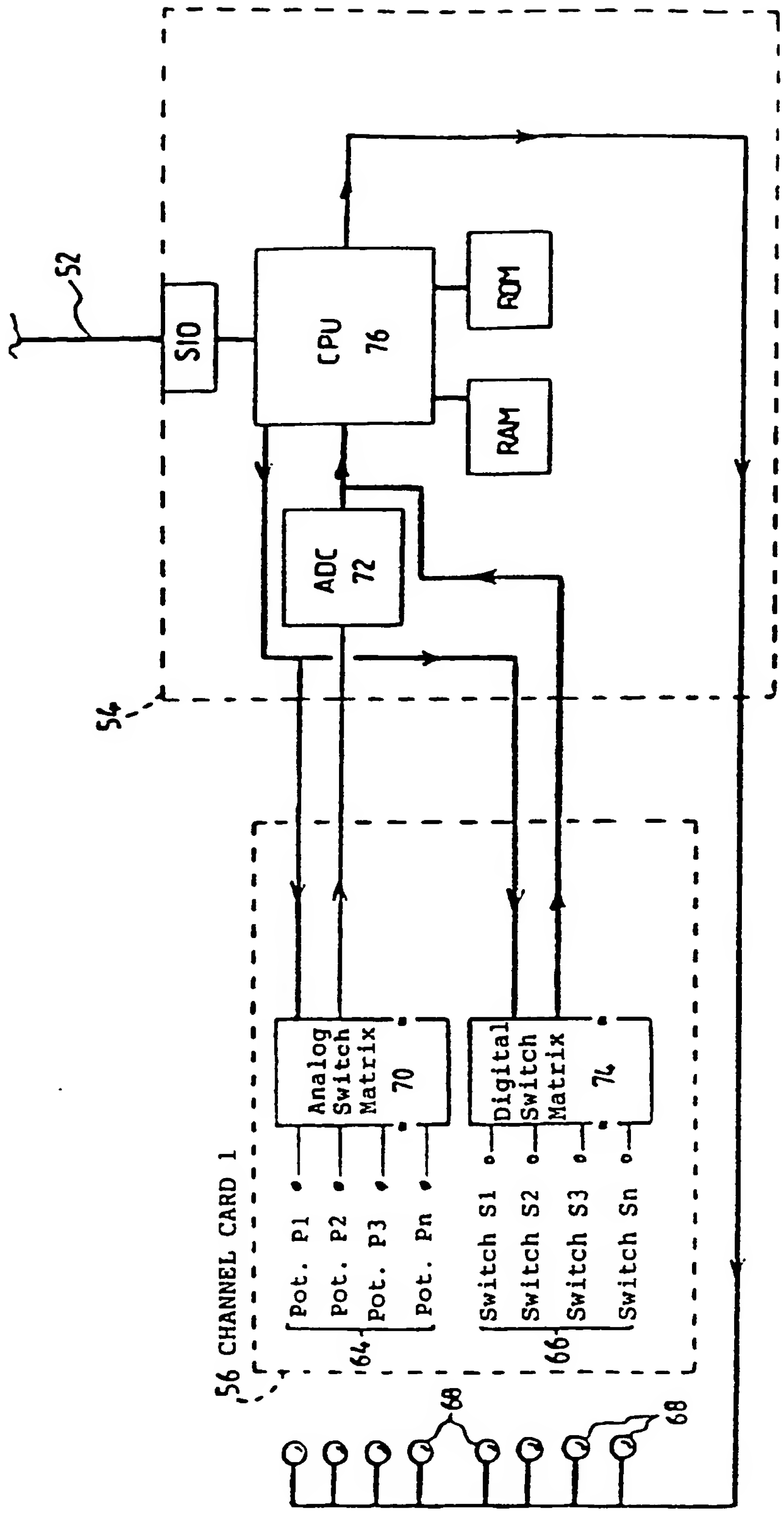
52
SIO
CPU
76
ROM
RAM
ADC
72
54
Analog Switch Matrix
70
Digital Switch Matrix
74
56 CHANNEL CARD 1
Pot. P1
Pot. P2
Pot. P3
Pot. Pn
Switch S1
Switch S2
Switch S3
Switch Sn
64
66
68
68

FIG.3

INTERNATIONAL SEARCH REPORT

International Application No PCT/GB 9100830

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all)[6]

According to International Patent Classification (IPC) or to both National Classification and IPC

H 04 H 7/00 G 11 B 27/00

II. FIELDS SEARCHED

Minimum Documentation Searched[7]

Classification System	Classification Symbols
Int.Cl.5	H 04 H G 11 B G 10 H

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched[8]

III. DOCUMENTS CONSIDERED TO BE RELEVANT[9]

Category °	Citation of Document, [11] with indication, where appropriate, of the relevant passages [12]	Relevant to Claim No.[13]
X	US-A-4 291 604 (SCOTT et al.) 29th September 1981, see column 18, line 23 - column 19, line 19; figure 2	1-4,6-9,17-20,28
A		12-16

X	US-A-4 187 544 (LARNER) 5th February 1980, see column 8, lines 46-60; column 3, line 17 - column 4, line 4	1,2,6,7
A		23-25

A	US-A-4 479 240 (McKINLEY,Jr) 23rd October 1984, see column 3, lines 25-43 (cited in the application)	1-5
	--- -/-	

° Special categories of cited documents : [10]

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

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IV. CERTIFICATION

Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report
26-07-1991	20.08.91
International Searching Authority	**Signature of Authorized Officer**
EUROPEAN PATENT OFFICE	Mme. M. van der Drift

International Applic. No PCT/GB 9100830

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)

Category °	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No.
A	US-A-3 842 183 (AOKI) 15th October 1974, see abstract; column 1, lines 60-68; column 3, lines 3-28; figure 1 ---	1,11
A	US-A-4 514 727 (VAN ANTWERP) 30th April 1985, see column 2, lines 18-49 -----	10

ANNEX TO THE INTERNATIONAL SEARCH REPORT ON INTERNATIONAL PATENT APPLICATION NO. GB 9100830 SA 48059

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the European Patent Office EDP file on 06/09/91
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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US-A- 4291604	29-09-81	None	
US-A- 4187544	05-02-80	None	
US-A- 4479240	23-10-84	None	
US-A- 3842183	15-10-74	JP-C- 1079540	25-01-82
		JP-A- 49078530	29-07-74
		JP-B- 55038676	06-10-80
		JP-C- 1069501	30-10-81
		JP-A- 49078531	29-07-74
		JP-B- 55038677	06-10-80
US-A- 4514727	30-04-85	None	

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82